Astro-Interferometric Modeling and Spatio-Spectral Reconstruction

Completed Technology Project (2014 - 2018)

Project Introduction

The increasing demand for higher-resolution astrophysical observations has led to the ongoing development of a spatio-spectral, or double-Fourier, interferometry technique, which was then extended for wide-field imaging. The practicality of this technique is currently being examined with analytical models and experimental testing at Goddard Space Flight Center with the Spatio-spectral Interferometer Computational Optical Model (SsICOM) and the Wide-Field Imaging Interferometry Testbed (WIIT), respectively. The proposed research intends to perform case studies to compare and analyze the model outputs with experimental measurements in order to characterize and quantify instrumental effects on image quality, as well as continue development and testing of the spatial-spectral image synthesis algorithm that reconstructs an image from the raw interferometric data. These hardware and software models will verify the validity of the interferometric imaging technique such that its status can be promoted to NASA Technology Readiness Level 6 (TRL6) with continued research. Wide-field spatio-spectral interferometry is the imaging technique that will be employed by future space-based infrared and ultraviolet interferometric observatories. Such interferometers are on NASA's high-priority technologies list (TABS 8.2.4) because they will provide the high-resolution and spectroscopic capabilities needed to answer some of the most basic astrophysical questions through identification of planetary systems and habitable planets, discovery of how stars and planets, including our own solar system, are formed, and discernment into how the universe works in general. Continued modeling, simulation, and maturation of this interferometric imaging technique are also considered high-priority (TABS 11.2.4a) because early science modeling and algorithmic development allows the conception of larger, long-term projects, such as a space-borne infrared wide-field spatio-spectral interferometer, to be eventually realized.

Anticipated Benefits

These hardware and software models will verify the validity of an interferometric imaging technique such that its status can be promoted to NASA Technology Readiness Level 6 (TRL6) with continued research. Wide-field spatio-spectral interferometry is the imaging technique that will be employed by future space-based infrared and ultraviolet interferometric observatories. Such interferometers are on NASA's high-priority technologies list (TABS 8.2.4) because they will provide the high-resolution and spectroscopic capabilities needed to answer some of the most basic astrophysical questions through identification of planetary systems and habitable planets, discovery of how stars and planets, including our own solar system, are formed, and discernment into how the universe works in general.

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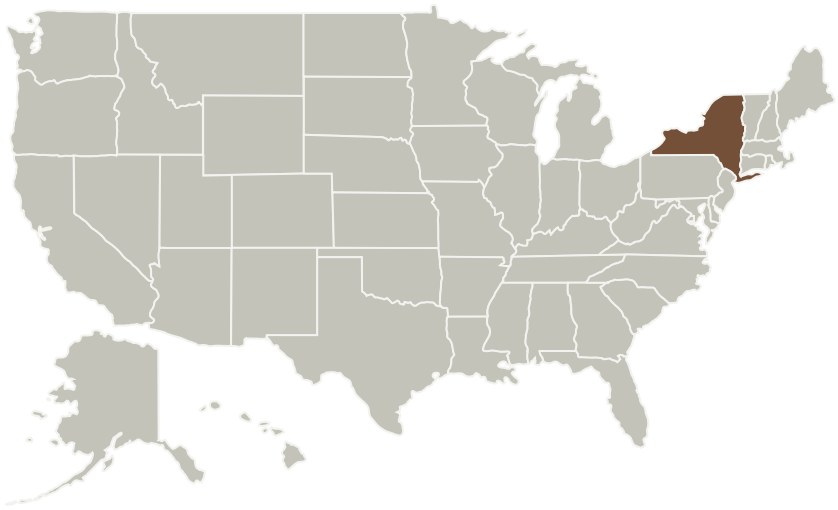
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
University of Rochester	Lead Organization	Academia	Rochester, New York

Primary U.S. Work Locations
New York

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Rochester

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

James R Fienup

Co-Investigator:

Alexander S Iacchetta

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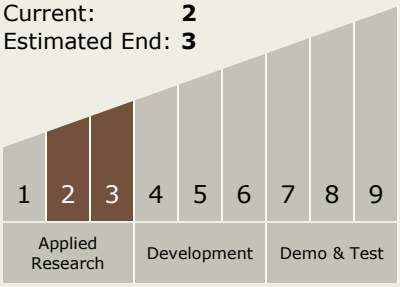
Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.2 Modeling
    - TX11.2.3 Human-System Performance Modeling

Target Destination

Outside the Solar System